REMARKS

Reconsideration of the above-identified application in view of the above amendments and following remarks is respectfully requested.

A. Status of the Claims

Claims 1, 3, 5-6, 8-10, 12-15, 17-18 and 20-26 were pending, with claims 18, 20-23 and 26 having been withdrawn by way of restriction. By this paper, these previously withdrawn claims are cancelled without prejudice or disclaimer.

In addition, new claims 27-31 are added. Each of these claims depends from independent claim 1. Claim 27 recites that the polymeric sheet is "a porous polymeric film" and that the ion exchange resin "is a polymer different from the polymeric film." Claims 28 and 29 recite porosity values of the polymeric sheet. Claim 30 recites that the polymeric sheet is "an expanded porous PTFE film" and has "substantially fibrils with substantially no nodes present." Claim 31 recites that "an interior volume of the polymeric sheet is substantially occluded by the ion-exchange resin." Support for these claims is found throughout the application as originally filed, including for example at pages 7, 16-17, and 22-23.

Two rejections were made against the previously pending claims. First, claims 1, 3, 8, 9, 12-15, 24 and 25 were rejected pursuant to 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Pat. No. 5,523,181 to Stonehart et al. ("Stonehart").

[4/23/08 office action at pp. 2-3]. Second, claims 5-6, 10 and 17, although found novel over the prior art, were rejected pursuant to 35 U.S.C. § 103(a) as allegedly being unpatentable over Stonehart in view of U.S. Pat. No. 6,059,943 to Murphy et al. [4/23/08 office action at p. 3]. These rejections are addressed below, and both should be withdrawn.

B. **Claims 1, 3, 8, 9, 12-15, 24 and 25 Are Patentably Distinct From Stonehart**

The rejection of claims 1, 3, 8, 9, 12-15, 24 and 25 is respectfully traversed. Stonehart is ***not*** on point and fails to disclose numerous claim elements, including for example "a polymeric sheet comprising a polymer and having a porous structure with a microstructure of fibrils," "the polymeric sheet having distributed in the polymer: i) metal; ii) an organic polymer," and "said porous structure being at least partially filled with an ion-exchange resin" as recited in Applicants' claim 1. Accordingly, a *prima facie* case of anticipation has not been made.

Specifically, Applicants' claim 1 recites:

> "1. An integral, substantially air impermeable polymeric membrane for use in an electrochemical apparatus or process comprising:
> a) a polymeric sheet comprising polymer and having a porous structure with a microstructure of fibrils,
> b) the polymeric sheet having distributed in the polymer:
> i) metal;

ii) an organic polymer; or

iii) a combination thereof, and

c) said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process."

Stonehart relates to perfluorosulfonic fuel cell membranes, and aspired to improve their water management. Figure 1 is a perspective view of such a fuel cell and shows an ion exchange membrane (1) between a cathode (2) and an anode (3). [Stonehart, Col. 9, lines 12-17]. Specifically, Stonehart contemplates a composite ion exchange membrane consisting of an ion exchange polymer filled with high-surface area silica. [Stonehart, Col. 3, lines 20-43]. Stonehart suggests that water management can be improved by selecting the silica to maximize its affinity for water and ability to retain water. [Stonehart, Col. 3, line 66 – Col, 4, line 4].

Stonehart's membranes are produced by suspending the inorganic, silica phase in a solvent appropriate for the dissolution of the polymer, and then blending the suspension with a solution of the ion exchange polymer in the same solvent. [Stonehart, Col. 4, lines 55-63]. To produce a polymer film filled with silica, the solvent is evaporated in a controlled manner. [Stonehart, Col. 4, lines 64-66].

Prior to the addition of the silica, Stonehart doesn't have a polymeric sheet at all. Instead, Stonehart is working with a NAFION™ ***solution***. After the addition of

the silica and evaporating of the solvent, Stonehart's final composite membrane is not described as "porous" or as having a microstructure of fibrils.[1] Stonehart certainly does not describe any membrane pores being "at least partially filled with an ion exchange resin" as recited in Applicants' claim 1. To the contrary, Stonehart's membrane is composed of the ion exchange resin itself and silica disbursed into that matrix.

Stonehart includes several examples which are consistent with the above understanding. In example 2, a 5% NAFION™ solution in isopropanol was mixed with 5 wt% fine particle silica. [Stonehart, Col. 8, lines 44-49]. After stirring, the solution is poured into a mold and dried to allow the isopropanol to evaporate. [Stonehart, Col. 8, lines 49-52]. The result is a NAFION™ membrane that contains 5 wt. % silica. [Stonehart, Col. 8, lines 52-54]. Example 3 is similar, except that silica fiber is substituted for the fine particle silica. [Stonehart, Col. 10, lines 7-14].

The office action cites to the disclosure at Stonehart's column 2, lines 14-19 and column 4, lines 20-24 as purportedly teaching a polymeric membrane with a porous structure. The passages at column 2, lines 11-40 describe four alleged improvements that Stonehart says were known in the art. The first passage, which was

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1 Applicants note that the office action is incomplete and should be withdrawn because all claim elements have not been addressed. For example, the element of claim 1 relating to a microstructure of fibrils is not addressed in the office action. [4/23/08 office action at pp. 2-3]. Nor does the office action properly explain why it contends that the elements of Applicants' claim 17 are present in the cited references.

cited by the office action, relates to an alleged teaching in the prior art to increase the functional groups in ion exchange resins to improve ion conductivity:

> "The method for improving the ion conductivity of the polymer solid-electrolyte membrane by ***increasing the level of ion-exchange functional groups*** in polymer solid electrolytes including hydrocarbon ion-exchange resins, fluorinated resins such as NAFION™ (the trade name of perfluorocarbon sulfonic acid developed by DuPont in the U.S.A.), and the like so as to lower the specific resistance of the polymer solid-electrolyte membrane." [Stonehart, Col. 2, lines 11-20].[2]

This discussion does not teach that Stonehart's membranes have "a porous structure with a microstructure of fibrils." This discussion does not even suggest that Stonehart's NAFION™ membranes are porous.

The second passage cited by the office action is equally off the mark, and relates to Stonehart's preferences for certain silica to fill his ion exchange resin membranes:

> "The silica according to the present invention ***is preferably a high pure silica*** in an amorphous crystalline structure which has a fine particle size and a high specific surface area.... Moreover, in the same particle sizes, the higher the surface area, that is, more porous, the higher the hygroscopicity, so that the specific resistance of the polymer solid-electrolyte composition is reduced." [Stonehart, Col. 4, lines 15-24]

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2 Throughout this paper, all emphasis has been added unless otherwise noted.

Again, this discussion does not teach membranes having a porous structure with a microstructure of fibrils. Thus, Stonehart fails to teach, disclose or suggest "a polymeric sheet comprising polymer and having a porous structure with a microstructure of fibrils" and "said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process" as recited in Applicants' claim 1.

There are further errors in the office action. Elements of Applicants' claims describe materials distributed in the polymer of the polymeric sheet (e.g., "metal"). The office action cites to a passage at column 5, lines 40-44 of Stonehart as allegedly disclosing a "metal" distributed in the polymeric sheet. However, that passage from Stonehart talks about something completely different. It discusses a catalyst layer (reference numeral 2 or 3 in Figure 1) that is distinct from the ion exchange membrane (1):

> "[A]n electrochemical cell which has bonded ***catalyst layers*** as the anode and cathode with the polymer solid electrolyte type of fuel cell [is] able to use not only the polymer solid-electrolyte compositions of the present invention as a polymer solid-electrolyte layer, but also the silica with the catalyst particles in the catalyst layer, which are coated by the polymer solid-electrolyte compositions in the form of a film.... To promote the electrode reaction in the catalyst layer, it is desired that the weight ratio of the catalyst particle (or the catalyst in which platinum is used and dispersed on the surface of carbon particles) to the polymer solid electrolyte is

> allowed to be from 1/9 to 5/5." [Stonehart, Col. 5, lines 30-44].

In context, it is plain that Stonehart is discussing the presence of platinum in a catalyst layer. This is not a disclosure of platinum or any other metal being distributed in a porous polymeric sheet.

As support for the alleged disclosure of a "an organic polymer" distributed in the polymeric sheet as recited in Applicants' claim 1, the office action cited to the passages at column 3, lines 20-23, which describe the "first" and "second" aspects of Stonehart's disclosure. [4/23/08 office action at pp. 2-3]. As discussed below, these disclosures are not relevant to the claim element against which they were cited. At best, these passages suggest that Stonehart's electrolyte membrane may be made from various polymers.

Stonehart's "first aspect" aims to "provide[] the most preferable polymer solid-electrolyte composition available for the membrane of the electrochemical cell." [Stonehart, Col. 3, lines 20-23. This electrolyte composition includes "a polymer solid electrolyte selected from the group consisting of perfluorocarbon sulfonic acid polysulfones, perfluorocarbonic acid, styrene-divinylbenzene sulfonic acid cation-exchange resins and styrene-butadiene anion-exchange resins" and silica. [Stonehart, Col. 3, lines 23-30]. Stonehart's "second aspect" aims to "provide[] an electrochemical cell having improved performance, the cell consisting of an anode, a polymer solid-

electrolyte layer and a cathode," and similarly describes the composition of the polymer solid electrolyte layer. [Stonehart, Col. 3, lines 31-38].

These passages are not disclosing the distribution an organic polymer within a porous polymeric sheet as recited in Applicants' claim 1. Indeed, Stonehart does not even suggest combinations of polymers.

Thus, Stonehart fails to teach, disclose or suggest "the polymeric sheet having distributed in the polymer: i) metal; ii) an organic polymer" as recited in Applicants' claim 1.

Accordingly, as Applicant cannot find in Stonehart a disclosure of each and every claim element recited in Applicants' independent claim 1, that independent claim is respectfully asserted to be in condition for allowance. Dependent claims 3, 8, 9, 12-15, 24, 25 and 27-30 are asserted to be patentably distinct from Stonehart for at least similar reasons.

C. **Claims 5-6, 10 and 17 Are Patentably Distinct From Stonehart In View of Murphy**

The rejection of claims 5-6, 10 and 17 as allegedly being obvious over Stonehart in view of Murphy is respectfully traversed. As discussed above in connection with Applicants' claims 1, 3, 8, 9, 12-15, 24 and 25, Stonehart's disclosure differs markedly from Applicants' claim 1. To the extent that the office action relies on Stonehart for its allegedly disclosure of "a polymeric sheet comprising polymer and

having a porous structure with a microstructure of fibrils," "said porous structure being at least partially filled with an ion-exchange resin" and "the polymeric sheet having distributed in the polymer: ... ii) metal; iii) an organic polymer" as recited in Applicants' claim 5, the above-discussion is incorporated by reference. There is no such disclosure in Stonehart. Below we address the secondary Murphy reference. Suffice it to say it shares Stonehart's deficiencies and specifically does not teach, disclose or suggest "said porous structure being at least partially filled with an ion-exchange resin" as recited in Applicants' claim 5.

Murphy is directed to a composite membrane for use in electrochemical devices that is made from two components. The "composite membrane consist[s] of *[1]* an inorganic component, active for the conduction of protons or other cations, bound together by *[2]* a polymeric binder phase, which may, or may not, be an ionic conductor." [Murphy, Col. 10, lines 40-43 (numerals added)]. The inorganic component comprises solid oxide particles, and not a polymer resin. [Murphy, Col. 8, lines 47-51; Col. 10, lines 50-64]. These oxide particles are "[a]lternatives to polymer proton conductors." [Murphy, Col. 2, lines 65-66].

Illustrative is Murphy's example 1, which discloses a composite membrane made from a porous PTFE filter that is provided in its pores with zirconium phosphate, i.e., the inorganic solid particle proton conductor. [Murphy, Col. 31, lines 29-61]. The

inorganic proton conductor is ***not*** distributed into the PTFE polymer itself. An ion exchange resin is ***not*** described as being included in the pores of the PTFE membrane in this example.

The office action asserted that Murphy discloses that "the porous structure is at least partially filled with an ion-exchange ***particles*** [sic] to provide ionic conductances" and cited to claim 1. [4/23/08 office action at pp. 3-4; see also 8/9/07 office action at p. 2].[3]

Murphy's claim 1 recites a composite membrane having (1) a solid inorganic particle component active for the conduction of protons or other cations and (2) a polymeric binder phase:

> "1. A cation-conducting, essentially gas impermeable composite membrane, comprising ***a polymeric matrix*** filled with ***inorganic oxide cation exchange particles*** forming a connected network extending from one face of the membrane to another face of the membrane." [Murphy, Col. 14, lines 12-16].

The office action fails to identify whether it is the polymer matrix or whether it is the inorganic oxide cation exchange particles that are said to correspond to Applicants' "ion-exchange resin." Neither does.

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3 Although this assertion was thoroughly refuted in Applicants' August 9, 2007 Reply (see p. 4), no substantive response was provided by the PTO. Applicants strongly urge the PTO, if this application is not allowed to proceed to issuance, to respond in detail to each argument raised and to explain any specific points of disagreement.

The polymer matrix material cannot constitute an ion exchange resin filling the porous structure, as recited in Applicants' claim 5. The polymer matrix material is the porous structure itself. [Murphy, Col. 9, lines 9-12; Col. 11, lines 1-15]. Murphy never teaches that ion exchange resin at least partially fills the porous structure of a polymer matrix material. The inorganic oxide cation exchange particles of Murphy are described as being ***alternatives*** to polymer resins. [Murphy, Col. 2, lines 65-66].

Thus, Murphy fails to teach, disclose or suggest "c) said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process" as recited in Applicants' claim 5.

At page 4, the office action makes reference to "Koslow," which is understood to be a reference to U.S. Pat. No. 5,147,722, and which had been previously cited. The office action does not, however, rely on Koslow as allegedly teaching any of Applicants' claim elements, but seems instead to suggest that Koslow provides motive to use fumed silica in the combination of Stonehart and Murphy. Without commenting on that assertion, Applicants note that the office action has not alleged that Koslow teaches, discloses or suggests "c) said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process" as recited in Applicants' claim 5.

Accordingly, as Applicant cannot find in Stonehart, Murphy or Koslow a disclosure of "c) said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process" as recited in Applicants' independent claim 5, that independent claim is respectfully asserted to be in condition for allowance. Independent claim 10, and dependent claims 6 and 17 are asserted to be patentably distinct for at least similar reasons.

Applicants have chosen in the interest of expediting prosecution of this patent application to distinguish the cited documents from the pending claims as set forth above. These statements should not be regarded in any way as admissions that the cited documents are, in fact, prior art. Likewise, Applicants have chosen not to swear behind Murphy, cited by the office action, or to otherwise submit evidence to traverse the rejection at this time. Applicants, however, reserve the right, as provided by 37 C.F.R. §§ 1.131 and 1.132, to do so in the future as appropriate. Finally, Applicants have not specifically addressed the rejections of the dependent claims. Applicants respectfully submit that the independent claims, from which they depend, are in condition for allowance as set forth above. Accordingly, the dependent claims also are in condition for allowance. Applicants, however, reserve the right to address such rejections of the dependent claims in the future as appropriate.

CONCLUSION

For the above-stated reasons, this application is respectfully asserted to be in condition for allowance. An early and favorable examination on the merits is requested. In the event that a telephone conference would facilitate the examination of this application in any way, the examiner is invited to contact the undersigned at the number provided.

THE COMMISSIONER IS HEREBY AUTHORIZED TO CHARGE ANY ADDITIONAL FEES WHICH MAY BE REQUIRED FOR THE TIMELY CONSIDERATION OF THIS AMENDMENT UNDER 37 C.F.R. §§ 1.16 AND 1.17, OR CREDIT ANY OVERPAYMENT TO DEPOSIT ACCOUNT NO. 13-4500, ORDER NO. 0769-4624US5.

Respectfully submitted,
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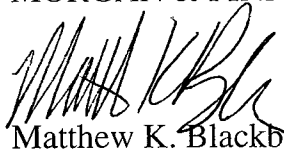
Dated: October 21, 2008 By: 

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